Cross-Enterprise Technology Development Program

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STAFF

Janice Buckner/Earth Science

Fred Herrero/Space Science

Chris Schwartz/Team Lead

Larry Ziegenfuss/Human Exploration

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Program Overview

CETDP . . . .

- is an AGENCY program, not a Code S Program, but it is managed through the Office of Space Science by the Advanced Technology and Mission Studies Division (AT&MS)
- effects cost saving by exploiting synergism of common Enterprise needs
- is responsible for developing critical space technologies that enable innovative and less costly missions
- serves four primary customers: ESE, HEDS, SSE & OCT
- focuses on low TRL, far term technologies

Earth Science Far Term Vision

Earth-orbiting satellites providing the right information about earth processes to the right people (earth scientist, grade school children, farmers, etc.) at the right time.

CETDP Strategic Planning Workshop

Held March 2 - 4, 1999 at John Hopkins University, Applied Physics Lab.

Purpose

- Initiate an on-going collaborative relationship between the Enterprises (customers) and the Thrust Areas
- Review the CETDP program

Results of the Workshop:

- New understanding of Enterprise long-term needs by Thrust Areas.
- New understanding of the content, purpose and plans of the UPN 632 program by the Enterprises.
- Lessons learned for incorporation into future interactions
- Information obtained will be used in formulating the technology investment strategy and strategic directions for Thrust Areas

CETDP Strategic Planning Workshop

Overview

Total -97 participants - HQ(4), Enterprise (28), Formulator/Integrator (14), Thrust Areas (41)
Three day Workshop:
Day 1 - Enterprise Presentations;
Day 2 - Thrust Area Presentations;
Day 3 - TAM to Enterprise Discussions and interactions
Interactive Workshop: Verbal & Electronic; 1250+ comments captured

CETDP Workshop Results

Areas of Prime Interest Identified by Enterprises

Advanced Power and On-Board Propulsion

ESE: Weight / Cost reduction

SSE: Micronewton thrusters, solar sails, drag-free s / c, low cost high performance SEP, advanced solar arrays, Ascent / decent systems, aerocapture / aeroassist,

HEDS: Lightweight, portable high reliability power for microbiology refrigeration

Atmospheric and In-Space Systems

SSE: Low-mass descent/ascent propulsion, aerocapture, balloon & aircraft systems

HEDS: technologies for in-space manufacturing, rendezvous and docking

Breakthrough Sensors and Instrument Components

ESE: Lower cost for instruments, deployable optics, increased aperture size, reduction in mass, reconfigurable sensors for improved temporal resolution

SSE: High resolution imaging/spectroscopy, MEMS Sensors on a chip, laser metrology, advanced cryogenics, miniature geophysics station, micro-chemlab

CETDP Workshop Results

Areas of Prime Interest Identified by Enterprises

Distributed Spacecraft

ESE: Formation flying, sensor webs

SSE: Precision formation flying, constellations, distributed optical systems

HEDS: autonomous navigation and robots, avionics for distance/velocity measurements, adaptive communications

High-Rate Data Delivery

ESE: Constellation communication networks & architectures, improvements to computational/information processing

SSE: On-board low-noise transfer of detector data to telemetry, lightweight, low cost high data rate, 3-D Stack C&DH electronics module for nanosats/picosats, data transmission for constellations of 10's, 100's, 1000's S/C.

Micro/Nano Sciencecraft

ESE: Reconfigurable sensors, small sats in support of sensor web

SSE: 10's, 100's and 1000's spacecraft constellations

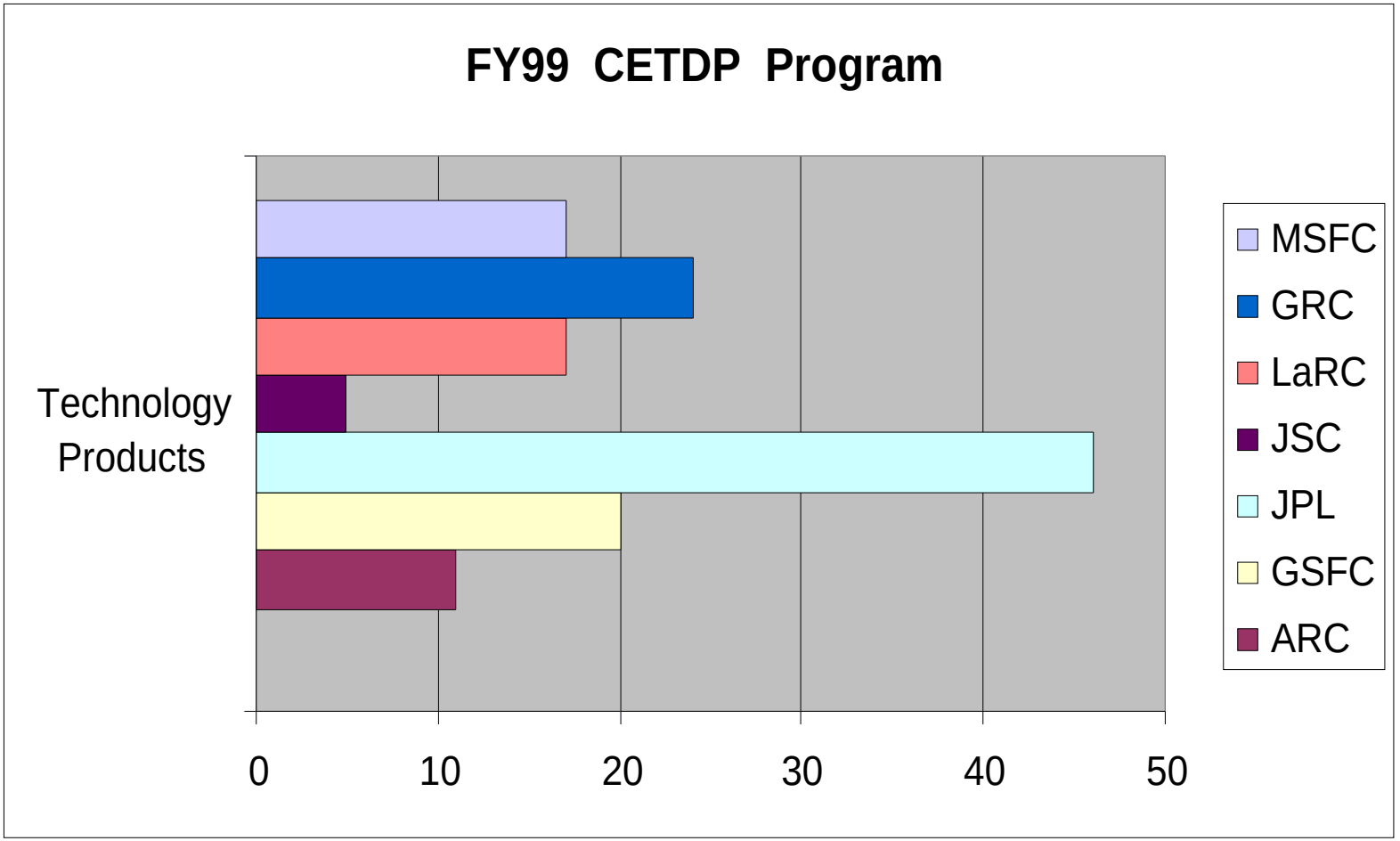
CETDP Workshop Results

Areas of Prime Interest Identified by Enterprises

Ultralight Structures & Space Observatories

ESE: Deployable optics, technology infusion resulting in COTS products
SSE: Very large aperture observatories, thin fresnel lens optics, inflatable optics, thermal isolation for optical stability in metrology, radiation tolerant
HEDS: Thermal management, radiators, radiation shielding, light-weight solar arrays

Earth Science Technology Products



CETDP Technology Inventory

ES

Product	Center
Advanced Microelectronics Devices and Nanotechnology	ARC
Coolers & Cryogenics (pulse tube, adv HEDS)	ARC
Design/Simulation Tools: Device & Process Modeling	ARC
Efficient constraint-based methods for flexible planning	ARC
MarsScape 2001	ARC
Model Specification and Analysis for Constraint-Based Planning	ARC
Multiple Interacting Robots	ARC
Optical Biological Material Development for Data Storage	ARC
Photo-realistic Virtual Reality Modelling	ARC
User Interface: Technology Infusion	ARC
Verification & Validation: Origins Modeling	ARC
CMOS Ultra Low Power Radiation tolerant (CULPRiT) Program	GSFC
Coolers & Cryogenics (mini, turboBrayton)	GSFC
Design/Simulation Tools	GSFC
Diffractive Telescope for Lidar	GSFC
Formation Flying Testbed	GSFC
High Performance Data Compression Technology	GSFC
High-eff Pulsed Laser	GSFC
Hyperspectral Imager	GSFC

CETDP Technology Inventory

Earth Science	
Integrated Flight Electronics Program at the Institute of Advanced Microelectronics at the University of New Mexico	GSFC
Laser Transmitter	GSFC
Microgyro	GSFC
Multi-Functional GPS	GSFC
Multi/Hyperspectral Image Mining	GSFC
Radiation Hardened reconfigurable Field Programmable Gate Array (RH rFPGA)	GSFC
SWIR & MWIR FPA's (GaN, InGaAs)	GSFC
Silicon Carbide Telescope Systems	GSFC
Synth. Thinned Aperture Rad. (STAR)	GSFC
Thermal Emission Limb Sounder	GSFC
Ultra Low Power CULPRiT	GSFC
Wide FOV Spectrometer	GSFC
Advisory Group on Electron Devices	HQ
2.5 THz Planar Mixer	JPL
Advanced Memory	JPL
Advanced Radar Technology	JPL
Advanced Semiconductor Lasers & Photonic ICs	JPL
CMR Oxide Magnetometers	JPL
Collaborative Infrastructure	JPL
Communications Tech Dev Testbed	JPL
Comp. Tomography Imaging Spectrometer	JPL
Delta-Doped CCDs & UV/Particle Detectors	JPL

CETDP Technology Inventory

Earth Science	
Design/Simulation Tools	JPL
Distributed Spacecraft	JPL
Free-Flying Magnetometer Technology Development Task	JPL
GPS-on-a-Chip	JPL
Hi-Efficiency SSPA's	JPL
High Actuator Density Deformable Mirror	JPL
High Tc Hot Elec. Bolometer	JPL
Hot Electron Bolometer Receivers	JPL
Hybrid Imaging Technology	JPL
Hybrid Optoelectronic Neural Object Recognition Systems (HONORS)	JPL
Inflatable SAR Antenna Experiment	JPL
Inflatable Solar Array Experiment	JPL
Inflatable Structures Technology	JPL
Knowledge Discovery or Science and Autonomy	JPL
LIGA/Thick Film Lithography	JPL
Local Oscillator Multiplexer	JPL
Local Oscillator Photomixer	JPL
MMIC Devices	JPL
Micro Electro Mechanical Systems (MEMS) Technology	JPL
Micro Weather Station	JPL
Microwave correlators	JPL
NASA Propagation Studies	JPL
Network Protocols	JPL

CETDP Technology Inventory

Earth Science	
Object Oriented Smart Executive	JPL
Optical Communications	JPL
Photonic IC's for Space Comm	JPL
Planning for Mission Design	JPL
QWIP-based IR HSI	JPL
Quantum Well IR Photodet. (QWIP)	JPL
SSPA Component Development	JPL
Self-Commanding Spacecraft	JPL
Sub-mm/Far-IR Mirror Technology	JPL
Surface plasmon tun filter/Spectr on a Chip (SPTF)	JPL
System Analysis and Outreach Activities	JPL
Uncooled IR Thermopile Detectors	JPL
User Interface	JPL
Verification & Validation (Microspacecraft Testbed)	JPL
Adjustable Autonomy Testbed	JSC
Ranger Integration	JSC
Ranger Telerobotic Shuttle Experiment	JSC
Real-time Learning Controllers for Enhanced Autonomy and Reliability of Space Robots	JSC
Space Operations	JSC
Advanced Piezoelectric Actuators and Sensors	LaRC
Attitude Determination and Control for Microspacecraft	LaRC
Characterization and Control of Microdynamic Response	LaRC

CETDP Technology Inventory

Earth Science	
Design & Simulation Tools	LaRC
Flexible Circuitry for Multifunctional Structures	LaRC
Fourier Transform Spectrometer Tech	LaRC
Low-CTE Structural Composites	LaRC
Materials for Inflatables	LaRC
MicroDIAL	LaRC
Microwave Processing of Materials	LaRC
Mixed Signal - Health and Status MCM/ASIC	LaRC
Optimized Processing of High-K Carbon-Carbon	LaRC
Precision Deployable Reflectors	LaRC
Radiation Shielding Materials	LaRC
Structural Mechanics of Inflatable Columns	LaRC
Thermal Dissipater for Laser Diodes	LaRC
Ultra Low Power Reconfigurable Controller	LaRC
Advanced Capacitor Technology (Energy Storage)	LeRC
Advanced Electrical Components Technology (Power Management & Distribution)	LeRC
Advanced High Efficiency Solar Cell and Array Technology (Power Generation)	LeRC
Advanced Photovoltaic Concepts (Power Generation)	LeRC
Advanced Thin Film Solar Cell and Ultra-Lightweight Array Technology (Power Generation)	LeRC
Aerospace Flywheel Technology (Energy Storage)	LeRC
Antenna Systems	LeRC

CETDP Technology Inventory

Earth Science	
Bipropellant Technology	LeRC
Fuel Cell Systems Technology (Power Generation)	LeRC
High Temperature Electronics (Power Management & Distribution)	LeRC
K-band Phased Array	LeRC
Lithium Battery Technology (Energy Storage)	LeRC
Low Temperature Electronics (Power Management & Distribution)	LeRC
MEMS Propulsion Technology	LeRC
Monopropellant Technology	LeRC
Multi-Chip Module Thermal Control for Adv Power Converters (Thermal Mgmt)	LeRC
NASA Aerospace Flight Battery Program	LeRC
Nickel Based Battery Technology (Energy Storage)	LeRC
Power Conditioning, Control & Management Technology (Power Management & Dist)	LeRC
Power System Surfaces/ Materials Technology (Space Surv/ Durability)	LeRC
Refined Power System Environmental Design Codes (Space Surv/ Durability)	LeRC
Solid State Electron Devices	LeRC
Transmitters/Receivers	LeRC
Vacuum Electron Devices	LeRC
A New Technique for Achieving Impact Velocities Greater Than 10 km/sec	MSFC
Design Guidelines for Ionizing Radiation	MSFC

CETDP Technology Inventory

Earth Science	
Development of Transient Test Techniques Representative of Typical Equipment Susceptibilities	MSFC
Development of a Spacecraft Materials Selector Expert System	MSFC
Diffractive Optics	MSFC
EDIFIS/OPAD (Engine Diagnostic Filter System/ Optical Plume Anomaly Detection)	MSFC
Electromagnetic Interference Susceptibility of New Technology Devices	MSFC
Electronic Properties of Materials with Application to Spacecraft Charging	MSFC
Integrated Lidar Scanner	MSFC
Interactive Spacecraft Charging Handbook	MSFC
Optical Phased Array	MSFC
Satellite Contamination and Materials Outgassing Effects Databases	MSFC
Space Environments and Effects Technology	MSFC
Space Radiation Electronics Testbed/STRV	MSFC
Testing and Optimization of Electrically Conducting Spacecraft Coatings	MSFC
Tests and Guidelines for Spacecraft Cable Charging and Discharging Under High Energy Electron Flux	MSFC
Trapped Proton Model	MSFC